**3GPP T****SG-RAN WG2 Meeting #121-bis R2-2304257**

**E-Meeting: April 17-26, 2023**

**Agenda item: 7.6.3.1**

**Source: Qualcomm Incorporated**

**Title: [offline-114] Neighbour cell measurements**

**Document for: Discussion and Decision**

# Introduction

This document provides the report of the following email discussion.

* [AT121bis-e][114][IoT NTN Enh] Neighbour cell measurements (Qualcomm)

Scope: Discuss the remaining proposals from R2-2303652 and whether recent RAN2#121bis-e agreements for NR NTN can be extended to IoT-NTN

Intended outcome: Summary of the offline discussion with e.g.:

* List of proposals for agreement (if any)
* List of proposals that require online discussions
* List of proposals that should not be pursued (if any)

Deadline for companies' feedback: Tuesday 2023-04-25 02:00 UTC

Deadline for rapporteur's summary (in R2-2304257): Tuesday 2023-04-25 04:00 UTC

Proposals marked "for agreement" in R2-2304257 not challenged until Tuesday 2023-04-25 20:00 UTC will be declared as agreed via email by the session chair (for the rest the discussion might continue online in the Wednesday CB session).

# Discussion

Following agreement is made.

Agreements:

1. New SIBxx is introduced to broadcast the neighbor cell/satellite information.

Following is the proposal 1 from R2-2303652.

Proposal 1 In addition to ephemeris and optional epoch time of the satellite associated with a neighbor cell, following parameters can be optionally broadcast as neighbor cell assistance information:

- (15/18) Validity duration.

- (15/18) Common TA parameters.

- (12/18) For fixed cell, cell start time.

- (9/18) FFS, cell stop time for fixed cell.

- (8/18) FFS, reference location and distance threshold for moving cell.

1. **Do you agree Common TA parameters are needed as assistance information for neighbor cell measurements? If No, please elaborate how does UE track neighbor cell timing drift.**

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| Company | Yes/No | Detail comments |
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1. **Do you agree validity duration is needed for the neighbor cell ephemeris as this information is carried in new SIBxx?**

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| Company | Yes/No | Detail comments |
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1. **If the answer to Q2 is No, how does UE know it is time to update neighbor cell ephemeris as it is in new SIBxx not in existing SIB?**

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| Company | Yes/No | Detail comments |
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1. **Please indicate Yes/No for if followings are needed as neighbor cell assistance information ?**
2. **Kmac**
3. **For fixed cell, cell start time**
4. **For fixed cell, cell stop time**
5. **For moving cell, reference location and distance threshold**

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| Company | (1) | (2) | (3) | (4) | Detail comments |
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Proposal 2 (15/18) In SIB, list of neighbor satellites is provided. For each satellite, list of frequencies/cells is included. FFS on clarification of the absence case of ephemeris and frequencies/cells.

* QC thinks this the simplest but indeed the list of frequencies consume a large number of bits
* ZTE agrees that the list of frequencies consume a large number of bits and wonders if the UE would also have to acquire SIB5 in this case. QC thinks this is the case.
* Apple wonders if adding a satellite ID to the frequency lists in SIB5 would impact of UE not supporting NTN
* HW wonders if it’s possible to have NTN and TN on the same frequency. QC thinks this scenario would have to be avoided.
* Continue offline

The ARFCN-ValueEUTRA-r9 is 18 bits (> 2 bytes) and PhysCellId is 9 bits (> 1 byte). Issue is size of list of frequencies and size of list of PCIs for each frequency.

1. **How to associate list of frequencies/cells with the satellite?**

Option #1: For each satellite, list of frequencies/cells is included

Option#2: Satellite indication in SIB5

Option#3: others

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| Company | Which Option | Detail comments |
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1. **Introduce satellite ID for the satellite in a list?**

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| Company | Agree/Disagree | Detail comments |
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\*\*\* Check whether recent agreements for NR NTN mobility enhancements can also be applied to IoT NTN enhancements \*\*\*

- RAN2#121 agreements for IoT NTN enhancements:

1. Location-based connected mode measurement initiation is supported in quasi-Earth-fixed cell (UE is not required to update the GNSS location for this). A serving cell reference location and a distance threshold/radius for detecting when to trigger connected mode measurements will be broadcast for quasi-Earth-fixed cell. FFS on whether the R17 IEs are reused or not. FFS if the same mechanism can also be used in idle (like in NR-NTN)

* Continue offline on the highlighted FFS (i.e. if the same mechanism can also be used in idle)
1. **For fixed cell, do you agree the same mechanism of location-based connected mode measurement initiation can also be used in RRC\_IDLE (like in NR-NTN)?**

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| Company | Agree/Disagree | Detail comments |
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2. Location-based connected mode measurement initiation is supported in earth-moving cell (UE is not required to update the GNSS location for this). A serving cell reference location and a distance threshold/radius for detecting when to trigger connected mode measurements will be broadcast for earth-moving cell. FFS on whether the R17 IEs are reused or not. FFS on whether additional information needs to be broadcast to inform the UE how the reference location moves over time or if this can be derived from other information (e.g. Epoch time and ephemeris). FFS if the same mechanism can also be used in idle (like in NR-NTN)

* Continue offline on the highlighted FFSs, taking into account the recent RAN2#121bis-e agreements for NR NTN
1. **For moving cell, do you agree the same mechanism of location-based connected mode measurement initiation can also be used in RRC\_IDLE (this should be optional feature in IDLE mode)?**

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| Company | Agree/Disagree | Detail comments |
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- RAN2#121bis-e agreements for NR NTN enhancements:

1. RAN2 understands that for earth-moving cell reselection, the UE can derive the trajectory of serving cell with rough accuracy based on serving satellite ephemeris and epochTime, with the assumption that the serving cell reference location broadcast by the network is the one at Epoch time (FFS whether a new epochTime IE is needed). RAN2 understanding is that both PVT and orbital parameters can be used for this. FFS if additional information is needed to allow more accurate measurements.

* Check offline if this can be extended to IoT NTN
1. **For moving cell, do you agree the UE can derive the trajectory of serving cell with rough accuracy based on serving satellite ephemeris and epochTime, with the assumption that the serving cell reference location broadcast by the network is the one at Epoch time (like in NR-NTN)?**

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| Company | Agree/Disagree | Detail comments |
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2. For earth-moving cell, new IE is introduced to indicate the reference location of serving cell.

* No need to check this (broadcast of serving cell reference location for earth-moving cell has already been agreed also for IoT-NTN, and clearly this will be a new IE)

3. For cell (re)selection in earth-moving system, a distance threshold is introduced for location-based measurement initiation, which reuses distanceThresh in SIB19.

* Check offline if “distanceThresh in SIB19” can also be used for IoT-NTN
1. **Should SIB31 be extended to include distanceThresh?**

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| Company | Agree/Disagree | Detail comments |
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4. For cell (re)selection in earth-moving system, time-based measurement initiation is used to address feeder-link switch case.

* Check offline if this can be extended to IoT NTN
1. **For cell (re)selection in earth-moving system, time-based measurement initiation is used to address feeder-link switch case.**

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| Company | Agree/Disagree | Detail comments |
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# Conclusion

[to be updated]

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